Portable Vaporizer

Background of the Invention

(1) Field of Invention

This invention relates to the field of heat vaporization of various substances, such as plant substances, medicines, etc., to produce smoke-free inhalable vapors.

(2) Description of Prior Art

Vaporization of volatile constituents of various substances without combustion by the application of heat for the purpose of inhaling said volatile constituents is a process that has been known for quite some time. US Patent number 87,603 of Mar 9, 1869 discloses the construction of a vaporizer which makes use of heated stones, heated metal or coals in an isolated chamber and the conduction of heat therefrom to release volatile constituents from medicinal substances in an adjacent chamber in order to make possible inhalation of said volatile constituents.

Since that time, numerous vaporizing devices of varied design and various levels of sophistication have been disclosed. Some use heat from

electrical heating elements as a means to accomplish vaporization without combustion, such as those disclosed in US Patent Nos. 2,104,266; 4,141,369; 4,303,083; 4,735,217; 4,907,606; 4,922,901; 4,947,874; 4,947,875; 5,060,671; 5,224,498; 5,249,586; 5,388,574; 5,388,594; 5,819,756; and 6,095,153. Other devices use the application of heat from a flame through an intermediary barrier of glass, metal, or other heat conducting material, thereby preventing direct contact of the flame with the substance to be vaporized, such as those disclosed in US Patent Nos. 437,070; 649,521; 1,071,389; and 1,405,802. Still other devices rely on the transfer of heat from the combustion of a solid fuel source, generally a carbonaceous material, such as those disclosed in US Patent Nos. 4,219,032; 4,340,072; 4,474,191; 5,042,509; 5,099,861; 5,105,831; 5,156,170; 5,345,951; and 6,598,607 (liquid fuel). And then there are a number of devices which rely on the application of internally or externally produced hot air to a vaporizable substance in order to achieve vaporization such as those disclosed in US Patent Nos. 5,993,748; 6,250,301; 6,481,437; 6,354,301; 6,513,524; and 6,532,965 (steam).

As outlined, for example, in US Patent Nos. 4,141,369; 4,303,083; 5,993,748; and 6,481,437; a key advantage of vaporization of a vaporizable substance over standard combustion of that same substance is the elimination of unwanted combustion byproducts and therefore a reduction in the health risks associated with inhalation of said combustion

byproducts. On the whole, the devices mentioned above, when constructed, calibrated and used properly, present effective means of releasing various volatile constituents from substances while avoiding the commingling of said volatile constituents with unwanted combustion by-products. Some devices, however, such as those disclosed in US Patent Nos. 4,219,032; or 4,340,072, actually make direct use of the hot combustion gases from the fuel source for heating the vaporizable substance and therefore arguably do not completely serve this purpose.

Depending upon the particular substance to be vaporized, vaporization also has other advantages over standard combustion, such as more efficient use (i.e. less waste) of the vaporizable substance, elimination of production and release of unwanted smoke fumes into the ambient atmosphere, improved taste, etc.

Although they may effectively vaporize vaporizable substances, many of the devices referred to above also have disadvantages:

All those devices utilizing electrical heating elements as heating means will necessarily require a source of electricity so they must either be plugged into an electrical outlet or be attached to a battery large enough to generate sufficient heat to bring about vaporization and which

can accomplish its function long enough so as to not to require constant replacement.

With the possible exception of the device disclosed in US Patent No. 1,405,802, those devices mentioned above which utilize a flame as a heat source are certainly too cumbersome to easily be carried in a pocket or purse. And the device disclosed in US Patent No. 1,405,802, would most likely require 3 hands to operate properly if one attempted to use a hand-held lighter as the heat source rather than a self-supported standing burner as heat source.

Those devices mentioned above which use electrically generated heated air as the heat source all require a device, either internal or external, to produce such heated air and are made more cumbersome by the inclusion of said electrical air-heating device.

Those devices which make use of solid fuel 1) require the purchase and supply of solid fuel rods, disks, etc. 2) release combustion products into the ambient atmosphere which may be offensive and/or hazardous to others in the vicinity as well as to the user of the device. In addition these devices pose fire hazards similar to burning cigarettes when not properly attended.

Further disadvantages include:

1) Many of the devices mentioned in all categories are expensive to produce.

2) Some of the devices hold the vaporizable substance in compartments which are hidden from view, making visual inspection and assessment of the state of the vaporizable substance more difficult once the vaporization process has begun.

3) Some devices require a continual supply of replacement parts, specialized fuel modules, or specially prepared vaporizable substances.

In addition to patented devices, there are also a number of other devices that have been disclosed in periodicals or are on the open market. In examining the various devices available, it is evident that they suffer from drawbacks similar to those outlined above. Many of these devices are quite expensive and cumbersome while the less expensive, more portable models are not completely effective at isolating combustion byproducts from desired volatile substances. In addition, some of the existing models of vaporizer require that the vaporizer, once 'loaded' with vaporizable substance, be required to be held relatively still in order to prevent the vaporizable substance from moving out of proper vaporizing position, and are thus unsuitable for transport once 'loaded' or for use in relatively unstable physical environments (e.g. during a bumpy car-ride).

It would be therefore desirable to provide a vaporizer: 1) which effectively separates desired volatile substances from unwanted combustion byproducts, 2) which is inexpensive to manufacture, 3) which is of such size and weight as to be easily portable, 4) which operates successfully using a standard cigarette lighter or the like as heat source with no need for an electrical source (battery or otherwise), external hot air producing device (heat gun, etc), or standing self-supported burner, etc., 5) which regularly requires no other specialized supplies such as specialized fuel rods, disks, mixtures, etc. besides the vaporizable substance itself, 6) in which the vaporizable substance is substantially contained in the vaporization chamber once inserted and will substantially remain in proper vaporizing position even if the 'loaded' vaporizer is turned in space, shaken, carried in the pocket or purse, etc., 7) which allows enjoyment of the full flavor of the vaporizable constituents without metallic, combustion, or other unwanted taste, 8) in which vaporization can easily be started and stopped quickly so as to avoid substantial waste of the vaporizable substance, and 9) which is preferably transparent, allowing easy visual assessment of the physical state of the vaporizable substance at any point in the vaporization process.

(3) Brief Description of the Drawings

Figure 1 shows an example of an outer vessel for the portable vaporizer

Figure 2 shows an example of an inner vessel for the portable vaporizer

Figure 3 shows an example of a grommet

Figure 4 shows an example of an assembled portable vaporizer

Figure 5 shows an example of an inner vessel for a 'slider-bowl replacement embodiment'

Figure 6 shows an example of an assembled 'slider-bowl replacement embodiment'

Figure 7 shows an example of an inner vessel for a 'cigarette-holder embodiment'

Figure 8 shows two examples of wraps on outer vessels:

Figure 8(a) shows a wrap that does not extend over the air intake vents

Figure 8(b) shows a wrap that extends over the air intake vents

(4) Reference Numerals in Drawings

100 Outer Vessel

102 Open proximal end of outer vessel

104 Closed distal end of outer vessel

106 Air intake vents on outer vessel

108 Heating area at distal end of outer vessel

110 Inner surface of closed distal end of outer vessel

200 Inner vessel

202 Open distal end of inner vessel

204 Partition in inner vessel

206 Screening hole in partition in inner vessel

208 Vaporization chamber in inner vessel

210 Drawing chamber in inner vessel

212 Spherical mouthpiece at proximal end of inner vessel

214 Open proximal end of inner vessel

216 Crimp at distal end of inner vessel

218 Distal end of spherical mouthpiece of inner vessel

300 Grommet

302 Length of grommet

304 Inner diameter of grommet

306 Proximal end of grommet

308 Distal end of grommet

310 Groove

312 Rounded Lip

400 Assembled portable vaporizer

500 Inner vessel of 'slider-bowl replacement embodiment'

502 Open proximal end of inner vessel of 'slider-bowl replacement embodiment'

504 Vaporization chamber in inner vessel of 'slider-bowl replacement embodiment'

506 Open distal end of inner vessel of 'slider-bowl replacement embodiment'

508 Partition in inner vessel of 'slider-bowl replacement embodiment'

510 Crimp at distal end of inner vessel of 'slider-bowl replacement embodiment'

512 Screening hole in partition in inner vessel of 'slider-bowl replacement embodiment'

600 Assembled 'slider-bowl replacement embodiment'

602 Sleeve

604 Water pipe

606 Mouth of slider bowl receiving tube of water pipe

608 Slider bowl receiving tube of water-pipe

610 Proximal end of sleeve

612 Distal end of sleeve

700 Inner vessel for 'cigarette holder embodiment'

702 Partition in inner vessel for 'cigarette holder embodiment'

704 Vaporization chamber in inner vessel for 'cigarette holder embodiment'

706 Screening hole in partition in inner vessel for 'cigarette holder embodiment'

708 Drawing chamber in inner vessel for 'cigarette holder embodiment'

710 Open proximal end of inner vessel for 'cigarette holder embodiment'

712 Open distal end of inner vessel for 'cigarette holder embodiment'

714 Air inlet holes in inner vessel for 'cigarette holder embodiment'

800A Outer wrap on outer vessel version 1

800B Outer wrap on outer vessel version 2

802 Outer wrap version 1

804 Distal raised ridge on surface of outer vessel

806 Proximal raised ridge on surface of outer vessel

808 Outer wrap version 2

810 Vent hole in wrap

812 Distal raised ridge on surface of outer vessel

814 Heavier bead at proximal end of outer vessel

(5) Summary of the Invention

The present invention is a vaporizer comprising minimally an inner vessel and an outer vessel. The outer vessel has an open proximal end and a closed distal end. An air intake vent(s) is located away from the heating area, preferably near the proximal end of the outer vessel. The vent(s) may be an opening(s) made through the surface of the outer vessel or the space between the surfaces of the inner and outer vessels at the open proximal end of the outer vessel may be left wholly or partially open so as to function as a vent.

The inner vessel is open at both ends, and has a partition spanning its interior cross-sectional area separating the inner volume of the inner vessel into a vaporization chamber distally and a drawing chamber proximally. This partition has screening holes through it allowing vapors to pass from the vaporization chamber into the drawing chamber.

The inner vessel is preferably longer than the outer vessel. Thus when the inner vessel is inserted into the outer vessel such that the distal end of the inner vessel abuts the inner surface of the distal end of the outer vessel, the proximal end of the inner vessel will protrude out

through the open proximal end of the outer vessel, thus making the proximal end of the inner vessel available for inhalation therethrough. When air is inhaled out through the proximal end of the inner vessel, a suction is created that draws air in through the air intake vents, distally between the inner surface of the outer vessel and the outer surface of the inner vessel, then into the vaporization chamber in the inner vessel, through the screening holes in the partition, into the drawing chamber in the inner vessel and out through the open proximal end of the inner vessel.

Depending upon the specific design, air is able to pass from the space between the inner and outer vessels into the vaporization chamber in the inner vessel either by traveling between the distal end of the inner vessel and the inside surface of the distal end of the outer vessel or through air inlet openings made through the surface of the inner vessel near the distal end of the inner vessel.

When a vaporizable substance is disposed into the vaporization chamber of the assembled device, and heat from a cigarette lighter or the like is applied to the heating area at the distal end of the outer vessel while air is suctioned through the device, air passing into the vaporization chamber is heated by heat radiating from and penetrating through the hot heating area of the outer vessel. This heated air subsequently heats the

vaporizable substance causing vaporization of various volatile constituents of the vaporizable substance. The heated air then carries the volatilized constituents with it into the drawing chamber and out through the opening in the proximal end of the inner vessel.

A material fastener, beyond human hands, to hold the two vessels in assembled position, is not a necessary part of the invention as the device will function so long as the vessels are in proper relation to one another. However, a fastener to hold the two vessels in proper assembled position does make the device much more convenient and efficient to operate. There are certainly many possible fasteners, including simple fasteners such as a strap or elastic band, which could function successfully as the fastener for the present invention. For most embodiments it is preferable that in assembled position, all parts of the fastener be located away from the heating area so as to avoid heating the fastener and/or interfering with the heating of the heating area. A grommet, made preferably of rubber or other elastic material, has been chosen as a non-limiting example of a fastener here for a number of reasons, including that it is effective, easy to use, inexpensive, unobtrusive, and easily replaceable should it wear out.

A number of materials can be successfully employed for construction of the vessels of the present invention, including glass,

metal, and ceramic, as well as combinations of material such as metal bonded to glass, etc. High temperature glass, such as PYREX®, has the advantages of being durable, inexpensive, and transparent. This type of material is also appropriately but not excessively conductive of heat for the current purpose as heat applied to the heating area remains substantially confined to the distal end of the device when the device is made of this material, making the device easier and safer to handle during and after usage. An optional insulating wrap is provided for further protection from heat.

With slight modification the portable vaporizing device becomes capable of replacing the standard slider-bowls used in many water pipes allowing the water pipe to be converted into a vaporizing device. With a different set of modifications the device becomes capable of vaporizing whole cigarettes or portions thereof.

(6) Detailed Description of the Invention

A) General Description

In one aspect, the present invention teaches a portable vaporizing device, the device generally comprising an outer vessel and an inner

vessel held together by a fastener. The invention also optionally comprises an outer insulating wrap.

The outer vessel has a closed distal end and an open proximal end. The inner vessel has an open proximal end as well as an open distal end. The inner vessel also has a partition within it, spanning the inner cross-sectional area of the vessel. The partition divides the inner volume of the inner vessel into two chambers, a vaporization chamber distally and a drawing chamber proximally. The partition also has screening holes through it to allow air to be drawn from the vaporization chamber through the partition into the drawing chamber, while keeping the vaporizable substance in place inside the vaporization chamber, the partition thus functioning essentially as a screening mechanism.

When the device is assembled, the inner vessel is inserted into the outer vessel through the open proximal end of the outer vessel preferably such that the distal end of the inner vessel abuts the inside surface of the distal end of the outer vessel. The inner vessel is preferably longer than the outer vessel so that in this abutted position, the proximal end of the inner vessel protrudes from the open proximal end of the outer vessel. The proximal end of the inner vessel is thus exposed to allow inhalation therethrough. The distal end of the inner vessel preferably abuts the inside of the closed distal end of the outer vessel in such a manner as to

substantially close off the opening at the distal end of the vaporization chamber, thus substantially trapping the vaporizable substance in the vaporization chamber.

It is also possible to create functional devices where the distal end of the inner vessel and the inside surface of the distal end of the outer vessel do not make contact with one another at all, there being a space between them when the vessels are in assembled position. However, the distance between the distal end of the inner vessel and the inner surface of the distal end of the outer vessel is preferably small enough in such arrangements so that particles of the vaporizable substance can not easily fall out of the open distal end of the vaporization chamber and out into the space between the vessels and therefore out of optimal vaporizing position when the device is turned freely in space or jostled.

If the inner vessel is significantly shorter than the outer vessel, once it is inserted into the outer vessel and brought into assembled position as above, the proximal end of the inner vessel will not protrude from the open proximal end of the outer vessel. The proximal end of the inner vessel is thus not directly available for inhalation therethrough. Therefore some sort of extension connected to the proximal end of the inner vessel is necessary to create a functional device in this case, whether that

extension is tubing, a connector, a mouthpiece, or some other sort of extension.

In one embodiment, the assembly may be designed so as to direct air to pass into the vaporization chamber by allowing it to travel around the distal end of the inner vessel through intentionally unsealed gaps between the distal end of the inner vessel and the inner surface of the closed distal end of the outer vessel, and then on into the vaporization chamber. As a second embodiment, the design may be to make air inlet openings through the surface of the inner vessel near the distal end of the vaporization chamber so as to allow air to pass from the space between the inner vessel and the outer vessel through these openings into the vaporization chamber. A third embodiment is a combination of gaps at the abutment area and openings through the surface of the vaporization chamber.

The fastener holds the two vessels together in the assembled position. Depending on the design, the fastener may also seal the proximal end space between the assembled vessels (or between the outer vessel and extension), thus necessitating the inclusion of other air intake vents. If this space between the open proximal end of the outer vessel and the outside surface of the inner vessel (or extension) is left wholly or partially unsealed, no other air intake vents may be necessary.

There are numerous alternative possible embodiments which will work satisfactorily. The exact dimensions of the vessels and fastener specified are not critical to the proper functioning of the vaporizer so long as the parts fit each other. A somewhat larger or smaller vessel assembly as regards length and/or circumference is possible so long as there is an appropriate air space between the outer surface of the inner vessel and the inner surface of the outer vessel so as to permit proper air flow through the device during usage. The inner vessel may be significantly longer than the outer vessel so that a significant portion of the inner vessel protrudes out of the open proximal end of the outer vessel when the device is assembled. Or the inner vessel may be only slightly longer that the outer vessel so that just enough length to be utilized as a mouthpiece protrudes out from the proximal end of the outer vessel. Or the outer vessel may be longer than the inner vessel, thus requiring some type of extension be included in the assembled device to allow access to the proximal end of the inner vessel for the purpose of inhalation therethrough. Among other possibilities, a length of tubing, a separate mouthpiece or the fastener itself could serve as said extension to allow access to the inner vessel in this situation.

The vessel surfaces may be made thinner or thicker in places so long as they are:

1) sufficiently thick to withstand the applied heat, the hot air flow through the device, and the repeated surface to surface contact involved in assembling and disassembling the device; and

2) sufficiently thin to allow ready conduction of heat from a flame through the surface of the outer vessel to the air in between the two vessels.

A further consideration is to make sure that the user's hand will not be burned once heat is applied to the heating area at the distal end of the outer vessel and so there must be sufficient distance between the spot where the heat is applied and the area where the hand holds the device, so as to eliminate conduction of unacceptable levels of heat to the area where the hand holds the device. The characteristics of the materials used for construction thus have impact on the acceptable dimensions of the constructed device. Similar considerations must be kept in mind to ensure that the vessel lengths are sufficiently long so as to prevent excessive heat being conducted to the proximal end of the inner vessel so that a user's lips are not burned.

An optional insulating wrap is provided as further protection for the hands. A shorter vessel assembly may be acceptable if an insulating wrap is wrapped around the outer vessel proximal to the heating area, thus

preventing the hand from being burned by heat conduction through the outer vessel, so long as the device still has sufficient length to prevent overheating of the proximal end of the inner vessel. The wrap can be made of any heat insulating substance such as rubber, KEVLAR®, leather, fabric or the like.

The partition in the inner vessel may be placed at different positions to create a larger or smaller vaporization chamber size to accommodate larger or smaller amounts of vaporizable substance as desired. Further, the pattern and/or shape of screening holes through the partition can be varied in numerous ways without problem. For example, the screening holes could be round, slotted, diamond-shaped or any other shapes. There are any number of screening hole patterns which could effectively function as a screening mechanism to allow vapors to pass and prevent solid unvaporized substance from being inhaled. The number, shape and size of screening holes selected will affect the drawing pressure necessary to produce a given airflow through the device.

Another necessary feature of the invention is that there be one or more air intake vents located away from the heating area, preferably near the proximal end of the outer vessel. These vents are for the purpose of clean air intake into the space between the inside surface of the outer vessel and the outside surface of the inner vessel. Again, the number of

air intake vents, their exact size and their exact placement is not critical to the proper functioning of the unit. However, placing these vents away from the heating area is a key feature of this invention as it serves the important purpose of separating the air intake into the device from the area where fuel combustion occurs externally, thus minimizing the inhalation of fuel exhaust fumes into the device and into the lungs.

The space between the opening in the proximal end of the outer vessel and the outer surface of the inner vessel (or extension) can serve as an air intake vent or, alternatively, openings of various design can be made through the surface of the outer vessel to serve as air intake vents. The air intake vents can be placed in any number of patterns, using a smaller or larger number of vents, as well as a somewhat smaller or larger vent size, or even different shaped vents. The number and size of the vents chosen will also affect the drawing pressure necessary to produce a given airflow through the device.

The fastener should be such that it holds the inner and outer vessels in position relatively firmly once they are assembled together. The fastener should also be such that it is easily releasable for ready disassembly and reloading of the device. And, although it is not necessary in all cases, it is preferable for the fastener to be located away from the heating area when the device is assembled. This prevents the

fastener from being heated extensively during the vaporization process as well as prevents the fastener from interfering with the heating of the heating area. There are many possibilities which will function successfully for the present application.

One possibility for a fastener is a grommet, preferably made of elastic material, such as rubber. The grommet snugly encircles the outer surface of the inner vessel (or extension) at the appropriate region such that it seals the space between the open proximal end of the outer vessel and the outside surface of the inner vessel (or extension) when the inner vessel is assembled with the outer vessel by insertion. A properly fitted fastener of this type can serve to fasten the two vessels together and can also be readily unfastenable, thus functioning essentially as a removable locking one-holed stopper. Many different designs of grommets can function successfully for this purpose. When such a fastener is used, the space between the open proximal end of the outer vessel and the outer surface of the inner vessel (or extension) can no longer be used as a vent since that area is sealed. One option would be to make vent openings through the surface of the outer vessel as discussed above. A second option for air intake vents in this case is to make openings through the fastener.

Other possibilities for fasteners would be to use a channel-locking or screwing mechanism to hold the two vessels together. The surfaces of the two vessels can be fitted with, or designed to include, outcroppings or threads of various types that interlock to hold the two vessels in place once the inner vessel is inserted into the outer vessel and twisted, for example. In such an arrangement, the locking mechanism itself can have air intake vents which pass through it to allow proper airflow through the device, or alternatively, the air intake vents can be made through the surface of the outer vessel, away from the heating area as above. Depending upon which materials are used to fabricate the vessels, these channel locking and screwing embodiments have the drawback of being potentially more expensive to produce due to the more complex work involved.

Any number of reusable fasteners could work successfully to hold the inner and outer vessels together when assembled and then to allow easy disassembly for reloading. As long as the inner vessel is not too short, the human hand can function as the necessary fastener to hold the two vessels in position during use although this solution has obvious inconveniences. Still other fasteners, e.g. an O-ring, rubber band or strap, may be employed.

For the device to function properly, it is important that sufficient air can flow into the vaporization chamber from the space between the inner surface of the outer vessel and the outer surface of the inner vessel. One method of allowing this airflow is to create gaps at the abutment area where the distal end of the inner vessel abuts the inner surface of the distal end of the outer vessel. For example, depending on the design of the vessels, one or more notches around the circumference of the opening at the distal end of the inner vessel can allow airflow into the distal end of the vaporization chamber. A second method to ensure adequate airflow from the space between the two vessels into the vaporization chamber is to make air inlet openings through the surface of the inner vessel into the vaporization chamber. Or, in an arrangement as mentioned above, where the distal end of the inner vessel does not actually abut the inner surface of the distal end of the outer vessel, the gap in between these two can serve to allow air to enter the vaporization chamber.

It is also convenient to have an appropriately shaped mouthpiece through which to inhale during the vaporization process. One possibility is to make such a mouthpiece integral to the proximal end of the inner vessel. Another possibility is to utilize a separate mouthpiece which attaches to the proximal end of the inner vessel.

A number of materials are suitable for constructing the vessels of the present invention. High temperature glass, for example PYREX®, has the advantages of being transparent, being effective at substantially containing heat in the heating area, and of not negatively affecting the taste of the vapors produced. Using, for example, metal, one would lose all or some of these advantages but gain the advantage of making the assembly more durable. Ceramic is another possibility. Other materials or combinations of materials, e.g. metal bonded to glass, could be employed as well. As long as one uses heat-safe, non-toxic materials which suitably conduct heat to the air which flows inside the assembly, some degree of success with vaporization should be possible although there is some variation in the exact qualities of the process depending on which materials are chosen.

B) Specific embodiments

Referring to figure 1, there is shown one embodiment of an outer vessel (100). In this embodiment of the invention, the outer vessel (100) is a standard test tube shape, a 15.3 cm long test tube made of high temperature glass, for example PYREX®, with an open proximal end (102) and a rounded closed distal end (104). Throughout the body of the vessel (100) the outer diameter is 19 mm, the inner diameter is 16.6 mm, and the thickness of the glass is 1.2 mm. The open proximal end of the vessel

(102) flares out slightly, giving it an outside diameter of 20 mm. There is a heavier bead of glass at the closed distal end (104) as well as at the open proximal end (102) of the vessel, making the glass approximately 2 mm thick in these areas. Centered 2 cm from the open proximal end (102) of the vessel, there are three 5 mm diameter round air intake vents (106) going straight from the outer surface to the inside surface of the vessel, the air intake vents (106) being spaced equidistantly around the circumference of the test tube. The most effective heating area (108) is located at the very distal end of the vessel and extends approximately 1-2 cm from the end of the vessel. The measurements given above are typical. Generally useful ranges for measurements for outer vessels are from 9 cm to 200 cm in length and diameters ranging from 5 mm to 25 cm. The higher ends of these ranges as well as the extreme low ends of these ranges are probably more valuable for novelty applications as opposed to convenience, but can still yield functional devices. While these ranges are generally preferred for most uses, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes.

Referring to figure 2, there is shown an embodiment of the inner vessel (200). Here, the inner vessel (200) is approximately 17.3 cm long, a high temperature glass tube, straight throughout most of its length, with an open proximal end (214) and an open distal end (202). The outer

diameter of the vessel (200) is 12 mm and the inner diameter is 10 mm, the thickness of the glass being 1 mm throughout the body of the vessel (200). At a distance of 3 cm from the distal end of the vessel (202), there is a glass partition (204), 2 mm thick, perpendicular to the walls of the vessel (200) spanning the inner cross-section of the vessel (200). This partition (204) has through it 5 screening holes (206), 1.5 mm in diameter each, four placed in a square pattern, the fifth in the center, all spaced approximately equally over the surface of the partition (204). The partition (204) divides the interior space of the inner vessel (200) into a vaporization chamber (208) distally and a drawing chamber (210) proximally.

The proximal end of the vessel flares out into a spherical mouthpiece (212) integral to the inner vessel, extending from the proximal end of the vessel (214), distally to 2 cm away from the proximal end of the vessel (218). This spherical mouthpiece (212) is 2 cm in diameter and has a surface thickness of approximately 2 mm. On its distal side (218), the mouthpiece has a circular opening to the drawing chamber (210) and at its opposite, most proximal end, it has a 6 mm diameter round opening (214). The openings at both ends of the vessel (202) (214) have heavier beads of glass, giving them a thickness of approximately 1.4 mm.

The final 1 cm of length of the distal end of the inner vessel is crimped together to form two inwardly facing crests 180 degrees around the circumference from one another, such that the two crests close to a distance of 4 mm apart at their closest point to one another (216). This crimp (216) allows for better airflow between the distal end of the inner vessel (202) and the inner surface of the distal end of the outer vessel (104) on into the vaporization chamber (208). The measurements given above are typical. Generally useful ranges for measurements for inner vessels are from 9 cm to 200 cm in length and diameters ranging from 2 mm to 25 cm. The higher ends of these ranges as well as the extreme low ends of these ranges are probably more valuable for novelty applications as opposed to convenience, but can still yield functional devices. While these ranges are generally preferred for most uses, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes.

A heavier bead of glass is used on the distal end of the inner (202) and outer (104) vessels. Beyond serving to protect the heating area (108) from breakage due to applied heat, this heavier bead functions to prevent contact breakage in these areas that make solid on solid contact with one another during usage.

Referring to figure 3, there is shown an embodiment of a fastener (300). In this example, the fastener is a grommet (300) made of rubber. This grommet (300) is essentially a short sleeve or wide ring, designed to function as a removable locking one-holed stopper. It measures 13.8 mm from end to end along its cylindrical length (302). It has an inner diameter (304) of 9.2 mm throughout its length (302) and an outer diameter which ranges from 15.5 mm at its proximal end (306) to 12.2 mm at its distal end (308), the thickness of the ring varying along the length (302).

Beginning at the distal end of the grommet (308), where the outer diameter is 12.2 mm, and moving proximally along the grommet (300), the material thickens steadily until 8 mm along the grommet (300), where the outer diameter is 13.8 mm. At this point there is a groove (310) 2.6 mm wide around the circumference of the grommet (300), where the outer diameter is 12.2 mm. Then the final 3.2 mm in length (302) constitutes a rounded lip (312) where the outer diameter is 15.5 mm at its widest point. The measurements given above are typical. Many different designs for grommets which will function successfully with this device are possible. Generally useful ranges for measurements of grommets (300) are from 2mm to 20 cm in length and diameters ranging from 2mm to 25cm. The higher ends of these ranges as well as the extreme low ends of these ranges are probably more valuable for novelty applications as

opposed to convenience, but can still yield functional devices. While these ranges are generally preferred for most uses, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes. Of course, the particular sizes of grommet (300) to fit particular embodiments will be dependent on the sizes of the vessels (100) (200) and so must be chosen based on the measurements of the vessels (100) (200).

The grommet may be made of many materials but a grommet (300) made of rubber has some distinct advantages in this example. If a rubber grommet (300) wears out, it is easily and inexpensively replaced. Rubber grips glass well and so a grommet (300) made of rubber in the above example will produce a relatively strong removable locking seal in the assembled device. Further, the rubber serves to absorb shock thereby minimizing glass on glass impact.

Referring to figure 4, there is shown an embodiment of a portable vaporizing device (400). The portable vaporizing device (400) is assembled by first sliding the grommet (300) onto the distal end of the inner vessel (202) along the length of the vessel (200) so that the proximal (wide) end (306) of the grommet (300) is brought to abut the distal end of the spherical mouthpiece (218) located at the proximal end of the inner vessel (200). This grommet (300)/inner vessel (200)

assembly is then inserted into the outer vessel (100) such that the distal end (202) of the inner vessel is brought to abut the inside of the closed distal end (402) of the outer vessel (100). In this position, the grommet (300) fits into place in the opening (102) of the open proximal end of the outer vessel so as to provide removable locking seal at the opening in the proximal end of the outer vessel (102).

Referring to figure 8, two embodiments of an optional outer wrap on an outer vessel (800A) (800B) are shown. The wrap (802) (808) may be made of rubber, leather or other insulating material, such as KEVLAR®, and is to be wrapped around the outer vessel (100) proximal to the heating area (108) so as to protect a user's hand from burns should the outer vessel (100) become too hot. The wrap (802) (808) also serves to remind a user of the acceptable areas to hold the device (400) during and after use. The wrap (802) can extend from just distal of the air intake vents (106) near the proximal end of the outer vessel (102) along the outer surface of the outer vessel (100) until about 4 cm from the distal end of the vessel (104), so as not to cover the heating area (108). Alternatively, the wrap (808) can extend all the way to the proximal end of the outer vessel (102), with holes made through the wrap (810) corresponding to the position of the air intake vents (106), thus not obstructing air intake into the device through the air intake vents (106).

If an optional external insulating wrap (802) (808) is to be used, another option would be to place extra raised ridges of material around the circumference of the outer surface of the outer vessel (100) to prevent the wrap from sliding out of proper position. Where the wrap (802) extends from proximal of the heating area (108) until just distal of the air intake vents (106), two raised ridges of material can be used, one ridge (804) at approximately 4 cm from the distal end of the outer vessel and a second raised ridge (806) of material around the circumference of the outer surface of the outer vessel (100) just distal to the positioning of the air intake vents (106). When tightly wrapped, these ridges (804) (806) of material would then serve to keep the outer wrap (802) in proper position, preventing the outer wrap (802) from sliding into the heating area (108) of the outer vessel or covering the air intake vents (106).

Where the wrap (808) is designed to extend all the way to the proximal end of the outer vessel (102), one raised ridge (812) would be placed at approximately 4 cm from the distal end of the outer vessel (104) while the heavier bead of glass at the proximal end of the vessel (814) will serve as the second ridge to hold the wrap in place. The measurements given above are typical. Depending on the dimensions of a particular embodiment of the invention, the wrap may vary significantly in dimension and placement. The measurements above are given to illustrate some wraps that would properly fit the example of the 'portable

vaporizer embodiment' (400) given. The vaporizing device and wraps to fit it can be made in any size and the invention is not meant to be limited to any particular size or sizes.

Two additional embodiments of the device are also disclosed, which are designated the 'slider-bowl replacement embodiment' (600) as shown in figure 6, and the 'cigarette holder embodiment.'

The 'slider-bowl replacement embodiment' (600) is designed to replace a standard slider-bowl so as to provide a means for vaporization in conjunction with commonly manufactured water pipes (610).

Referring to figure 5, an example of an inner vessel (500) for the 'slider-bowl replacement embodiment' is shown. This inner vessel (500) is a tube made proportionally longer than the one utilized for the 'portable vaporizer embodiment' (200). There is no spherical mouthpiece (212) at the proximal end of the inner vessel (502) as there was in the portable vaporizer example (200). Instead the proximal end of the inner vessel (502) is designed to be inserted into the slider-bowl receiving tube of a water pipe (608).

Referring to figure 6, an example of an assembled 'slider bowl replacement embodiment,' (600) is shown. The outer vessel (100) is

substantially the same as the outer vessel from the 'portable vaporizer embodiment' (100) above. This example of the 'slider-bowl replacement' embodiment (600) utilizes an outer vessel (100) with a length of 15.3 cm, an outer diameter of 19 mm and an inner diameter of 16.6 mm, as in the 'portable vaporizer embodiment' (400) above. The inner vessel (500) has a constant outer diameter of 12 mm along its entire length and is 21.5 cm long. The distal end of the inner vessel (506) has the same crimping (510) as in the 'portable vaporizer' example (400) above and the partition (508) is likewise placed at 3 cm from the distal end (506) of the inner vessel. The screening holes (512) are substantially the same as in the 'portable vaporizer embodiment' (400) above. The measurements given above are typical. Generally useful ranges for measurements for outer vessels for the 'slider-bowl replacement' embodiment are from 4 cm to 75 cm in length and diameters ranging from 5 mm to 25 cm. Generally useful ranges for measurements for inner vessels for this embodiment are from 4 cm to 75 cm in length and diameters ranging from 2 mm to 25 cm. The higher ends of these ranges as well as the extreme low ends of these ranges are probably more valuable for novelty applications as opposed to convenience, but can still yield functional devices. While these ranges are generally preferred for most uses, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes.

In this example of the 'slider bowl replacement embodiment,' (600) although the grommet (300) could be successfully utilized, a sleeve (602) of rubber surgical tubing has been chosen instead. The sleeve (602) in this example has an inner diameter of 10.5 mm, a length of approximately 1.3 cm, and a thickness of approximately 3 mm. This diameter allows the sleeve when stretched to fit snugly onto the inner vessel. The sleeve (602) is slid onto the inner vessel (500) such that its distal end (612) is at 14.4 cm from the distal end of the inner vessel (506). In this embodiment the weight of the outer vessel (100) substantially creates a seal at the open proximal end of the outer vessel (102) as it rests on the distal end of the sleeve (612) and is held there by gravity. The proximal end of the sleeve (610) abuts the mouth (606) of the slider bowl receiving tube where the mouth (606) of the slider bowl receiving tube encircles the inserted inner vessel (500), substantially creating a seal at this location as well as limiting how far the inner vessel (500) can slide into the slider-bowl receiving tube (608).

The dimensions of sleeves (602) that are generally useful depends upon the dimensions of the vessels (100) (500) chosen as well as the particular configuration of device desired. The sleeve (602) preferably fits snugly around the outside surface of the inner vessel (500) and is thick enough that the open proximal end of the outer vessel may rest upon it as well as thick enough to create the above-mentioned seals at

the appropriate junctures. Generally useful ranges for the length of the sleeve (602) are from 1 mm to a meter or more. Sleeves having lengths near the bottom end of this range are the equivalent of rings. These measurements are typical. However, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes.

In addition, to the sleeve (602) arrangement described in the example of the 'slider-bowl replacement embodiment' (600) above, other configurations of sleeves (602) can be employed. Two sleeves (602) may be utilized simultaneously, one sleeve (602) positioned so its distal end (612) abuts and substantially seals the open proximal end of the outer vessel (102) and the second sleeve (602) positioned so its proximal end (610) abuts and simultaneously substantially seals the area where the mouth (606) of the slider bowl receiving tube encircles the inserted inner vessel (500). Yet another viable alternative is to utilize a single sleeve (602) and position it to abut only the open proximal end of the outer vessel (102) substantially creating a seal at this juncture as well as providing a support on which the inner vessel (500) can rest in proper position. Likewise a single sleeve (602) can be utilized and positioned so as to only abut the mouth of the slider-bowl receiving tube (606) where it encircles the inserted inner vessel (500) providing a seal at this juncture

as well as stopping the inner vessel (500) from sliding too far into the slider-bowl receiving tube (608).

An advantage of using a sleeve (602) as opposed to a grommet (300) in this embodiment is that the outer vessel (100) can simply be lifted off easily for reloading, etc., rather than having to be released from the stronger seal created by the grommet (300) in the portable vaporizer embodiment (400). The sleeve (602) may be made of many materials but is preferably made of an elastic material such as rubber.

Currently, most standard slider-bowls have tubes with an outside diameter of 12, 15 or 16 mm and therefore most standard slider-bowl receiving tubes (608) are made to receive slider-bowl tubes with one of these outer diameters. So, in this example, using an inner vessel (500) with a fixed outside diameter along its length of 12 mm will allow the proximal end of the inner vessel (502) to fit properly into the smallest of the three standard sizes of slider-bowl receiving tubes (608).

If one desires to replace the larger common sizes of slider-bowl, inner vessels (500) with constant outer diameters of 15 or 16 mm may be used but it would be necessary to alter the diameter of the outer vessel (100) given in the example above accordingly so as to make the outer vessel (100) large enough to accommodate a larger 15 or 16 mm outer

diameter inner vessel (500) with adequate space for appropriate airflow. Or, alternatively, an inner vessel (500) may be constructed such that only the proximal section of the inner vessel (500) has an outer diameter appropriate to fit the chosen size of slider bowl receiving tube (608). The more distal portion of the inner vessel (500) may be wider or narrower as desired.

Referring to figure 7, an example of an inner vessel (700) for the 'cigarette holder embodiment' is shown. The outer vessel (100) used for this example is substantially the same as that used for the 'portable vaporizer embodiment' (400) above. The example of the 'cigarette holder embodiment,' differs from the 'portable vaporizer' example above (400) in that the partition (702) in the inner vessel (700) is here placed at 9.5 cm from the distal end of the inner vessel (712). The vaporization chamber (704) is thus large enough to accommodate a standard cigarette. The dimensions can be adjusted to accommodate other cigarette sizes.

Further, this partition (702), rather than having five 1.5 mm diameter screening holes (206) through it, now has just one screening hole (706), 5 mm in diameter, through its center. This screening hole (706) is small enough to prevent a cigarette from sliding through but large enough to allow vapors from the vaporizing cigarette to pass from the vaporization chamber (704) through the partition (702) into the

drawing chamber (708) and onward to the proximal end (710) of the inner tube for inhalation.

The distal end (712) of the inner vessel is not crimped as in the 'portable vaporizer embodiment' (400) but rather, there are 4 air inlet openings (714) made through the surface of the inner vessel (700), 1.5 mm in diameter each, placed equidistantly around the circumference of the inner tube (700), centered at a distance of 4.5 mm from the distal end of the inner vessel (712), to allow airflow into the vaporization chamber (704). The measurements given above are typical. Generally useful ranges for measurements for outer vessels for the 'cigarette holder embodiment' are from 9 cm to 75 cm in length and diameters ranging from 5 mm to 25 cm. Generally useful ranges for measurements for inner vessels of this embodiment are from 9 cm to 75 cm in length and diameters ranging from 2 mm to 5 cm. The higher ends of these ranges as well as the extreme low ends of these ranges are probably more valuable for novelty applications as opposed to convenience, but can still yield functional devices. While these ranges are generally preferred for most uses, the device can be made in any size and the invention is not meant to be limited to any particular size or sizes.

Further, the air inlet openings may be varied in number, shape, size and placement and the measurements specified in the example here are

not meant to be a limitation as to the exact size, shape, number and/or placement of the air inlet openings. Likewise the partition (702) could be placed at other chosen distances along the vessel (700), thus varying the size of the vaporization chamber (704) so as to accommodate other size cigarettes or portions thereof, e.g. extra long cigarettes or half cigarettes, etc.

In the above example of the 'cigarette holder embodiment,' the main pathway of air into the vaporization chamber (704) is through the air inlet openings (714) rather than around the distal end of the inner vessel (712) between the distal end of the inner vessel (712) and the inner surface of the distal end of the outer vessel (110). The air inlet openings (714) have been added in this embodiment to ensure adequate airflow into the vaporization chamber (704) because the round distal end of the inner vessel (712) may substantially seal against the round inside surface of the distal end of the outer vessel (110) thereby substantially blocking airflow around the distal end of the inner vessel (712) into the vaporization chamber (704). This design allows for easy insertion of a cigarette into the distal end of the inner vessel (712) where a crimped end as above (216) on an inner vessel of this diameter would obstruct such insertion.

Other designs which allow sufficient airflow into the vaporization chamber (704) without the addition of these air inlet openings (714) are also possible. Any number of designs that create sufficient gaps between the distal end of the inner vessel and the inside surface of the distal end of the outer vessel area to allow airflow into the vaporization chamber (704) can function effectively. In addition to possibilities discussed above, another possibility is that the distal end of the inner vessel (712) can be flared to a larger diameter and then crimped slightly, thus both allowing easy insertion of a cigarette as well as creating sufficient gaps for airflow between the distal end of the inner vessel (712) and the inner surface of the distal end of the outer vessel (110) when the device is assembled. This same distal end design can also be used effectively with the 'portable vaporizer embodiment' (400) and 'slider-bowl replacement embodiment' (600) above, there offering easier access to the vaporization chamber for loading and unloading through an enlarged opening at the distal end of the inner vessel.

7) Operation

In order to use the portable vaporizer, one must first load the vaporization chamber (208) at the distal end of the inner vessel (200) with vaporizable substance. To accomplish this, the inner vessel (200) and outer vessel (100) must be disassembled from one another. The

vaporizable substance should be broken into small enough pieces to maximize surface area but of sufficient size pieces so as to minimize small particles being sucked through the screening holes (206) in the partition (204). A suitable grinding device may be employed to produce proper size pieces if desired.

One may then choose to simply insert vaporizable substance into the vaporization chamber (208) by hand or it also works well to use the inner vessel (200) straw-like, applying suction out through the proximal end (214) to suck the vaporizable substance into the vaporization chamber (208) at the distal end.

Once the vaporization chamber (208) is filled as much as desired, holding the inner vessel (200) with vaporization chamber (208) pointed up, the inner vessel (200), with the grommet (300) thereon, should be slid fully into the outer vessel (100) so that the distal end of the inner vessel (202) abuts the inner surface of the distal end of the outer vessel (110). In this position the grommet (300) is also in place, functioning as a removable locking one-holed stopper to close the open proximal end of the outer vessel (102). Now the assembly may be safely moved at any angle because the vaporization chamber (208) is now substantially closed off by the inner surface of distal end of the outer vessel (110) and the

vaporizable substance is therefore substantially held in place in the vaporization chamber (208).

For actual vaporization, holding the assembly (400) substantially horizontal is probably best but most degrees of tilting are acceptable so long as the distal end (104) is not tilted downward to the point where the flame heats the more proximal areas of the outer vessel (100) or where the user is endangered by having his hand, face, hair, etc over the flame. To avoid obstructing the airflow through the device (400), when holding the assembly during use, do not cover the air intake vents (106) with the hand. If an optional wrap (802) or (808) is included, hold the unit with hand only on the wrap (802) (808) in order to protect the hands from touching hot surfaces of the device (400).

To begin vaporization, hold a flame, such as that from an ordinary cigarette lighter, under the heating area (108) on the outer surface of the distal end of the outer vessel (100) such that the tip of the flame is just touching the outer vessel at the heating area located along the last 1-2 cm in length of the outer vessel (108). This specified heating area (108) is generally the optimal place to apply heat for most applications, however applying heat more proximally, so long as the device is constructed in such a manner which makes it safe to do so, may still result in successful functioning of the device, and may even be preferred in some instances.

Begin inhaling through the opening (214) in the spherical mouthpiece (212) at the proximal end of the inner vessel (200). As air is inhaled through the mouthpiece (212) in the proximal end of the assembly (400), a suction is created throughout the apparatus such that air is drawn in to the device through the air intake vents (106) then flows distally between the inner (200) and outer (100) vessels, flows around the distal end of the inner vessel (202) between the distal end of the inner vessel (202) and the inner surface of the closed distal end of the outer vessel (104), then flows through the vaporizable substance contained in the vaporization chamber (208), through the screening holes (206) in the partition (204) of the inner vessel (200), then proximally through the drawing chamber (210) in the inner vessel to the hole in the mouthpiece (212) and finally, into the user's mouth and lungs.

The flame heats the glass at the heating area of the outer vessel (108), which in turn heats the air passing between the inner (200) and outer (100) vessels past this point. The heated air then travels through the vaporizable substance, heating the vaporizable substance. This is the primary heating mechanism. Secondarily, the heated glass of the outer vessel (100) and air heated by the glass of the outer vessel subsequently heat the glass of the inner vessel (200) which subsequently conducts heat to the vaporizable substance in the vaporization chamber (208). The

vaporizable substance is thus heated to a suitable temperature to cause the release of desired volatile constituents.

There is a certain feel required to operate the vaporizer most effectively. When the air coming through the mouthpiece (212) starts to feel warm, vaporization is beginning. If there is any burnt taste at all, or if smoke rather than a vapor mist is produced, then the flame is being applied too intensely and should be removed momentarily. Once the unit is up to vaporizing temperature, the lighter may be removed and the unit will stay hot enough to continue vaporizing substance such that another effective inhalation may still be made. Heat and inhale until all desired volatiles are released from the substance in the vaporization chamber (208). Changes in color, taste, etc. will be indicators as to whether there is any more to be gained from continued heating of the current substance in the vaporization chamber (208). When the substance in the vaporization chamber (208) is used as much as desired, wait for the unit (400) to cool or else disassemble the unit being careful not to touch the hot distal ends of the outer (104) and inner (202) tubes. Empty the vaporization chamber (208) by dumping out or by blowing through the mouthpiece (212) and then refill for the next usage.

If any black soot gathers on the outside of the outer vessel (100) due to use of a disposable lighter, it may be wiped away with tissues or

cloth. Use of a refillable butane lighter will not produce such soot and is therefore preferred.

The 'slider-bowl replacement embodiment' (600) is operated in substantially the same manner as the 'portable vaporizer embodiment' (400). First the vaporization chamber (504) is loaded with vaporizable substance. The unit is assembled by sliding the inner vessel (500) into the outer vessel (100), such that the distal end of the inner vessel (506) abuts the inner surface of the distal end of the outer vessel (110) and such that the proximal end of the outer vessel (102) rests on the distal end of the sleeve (612), forming a seal at that juncture. The proximal end of the inner vessel (502) is slid into the slider bowl receiving tube (608) of a water pipe (604) such that the proximal end of the sleeve (610) abuts the mouth (606) of the slider bowl receiving tube, forming a seal at that point. The 'slider-bowl replacement' vaporizing device (600) will make an approximately 45 degree angle with the ground depending on the particular assembly used. Then using a flame to heat the heating area (108) at the distal end of the outer vessel and drawing air through the mouthpiece of the water pipe simultaneously will produce the vaporizing effect.

In the 'cigarette holder embodiment,' an unfiltered cigarette, or portion thereof, is placed into the vaporization chamber (704) and slid

until the distal end of the cigarette (or portion) is proximal to the air inlet openings (714). Once the device is thus 'loaded,' use of the 'cigarette holder embodiment' otherwise proceeds as for the 'portable vaporizer embodiment.' (400)